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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
PAPPAS, PETER	

ART UNIT	PAPER NUMBER
2671	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/058,905	Applicant(s) KASE ET AL.	
	Examiner Peter-Anthony Pappas	Art Unit 2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-7,10-17 and 19-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-7,10-17 and 19-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 4, 7, 10 and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kela (Hierarchical octree approximations for boundary representation-based geometric models) in view of Shu et al. (U.S. Patent No. 6, 075, 538).

3. In regards to claim 1 Kela teaches a solid modeling system (p. 1) utilizing hierarchical octree approximation for boundary representation-based geometric models (modified Octree division), wherein at the outset a bounding box for the solid (object) is computed. For simplicity it will be assumed that the solid boundary (boundary data) is contained wholly in the interior of the bounding box (p. 3, § The algorithm; Fig. 3). It is noted said system is considered to perform the method.

Kela utilizes three types of octants: octant that are wholly in the interior of the solid (non-boundary cells located in the interior region of the object), octants that are wholly outside the solid (non-boundary cells located in the outside of the region of the object) and octants that intersect the boundary of the solid (boundary cells including a boundary surface of the object) and are in general partially inside the solid (p. 1; Fig. 1). <u>It is noted that the open ended claim language of claim 1 (i.e. "...comprising the</u>

following steps...") does not limit the classification of cells to only one of a non-boundary cell or a boundary cell.

Kela teaches that the basic strategy adopted in the algorithm is based on the divide and conquer paradigm. Not only is the octant recursively subdivided, but the solid is also recursively portioned within each octant. First in this discussion is an examination of the octant decomposition process that breaks an octant into eight octants. The decomposition is achieved by bisecting pO (parent octant) with three mutually perpendicular planes parallel to the parent octant faces passing through the centroid of pO (p. 2-3, § Algorithm overview and notation; Figs 2-3). Each of the two linear bisectors (oflB) of the six faces of the parent octant are interested individually with $pofF_i$. The segments of the bisectors are then classified with respect to the solid. This is achieved by an orderly traversal of oflB and by computing normals at the intersection points (p. 4; Figs. 2, 4-5).

In Fig. 4 Kela illustrates an octant with twelve edges in which points (cut points) on said edges are identified where a given solid geometry intersects said edges. Fig. 1 illustrates a 2D example in which there are four edges.

Kela fails to explicitly teach storing the values of physical properties for each of the cells. Shu et al. al teaches that the present invention relates generally to 3D volume visualization and particularly to a new data structure and method and system which significantly reduces computational time and space in displaying surface structure of a three dimensional object (column 1, lines 7-11). Volume data is partitioned into NxNxN identical cubes called cells having 6 faces and 8 voxels or vertices, wherein each voxel

is associated with at least one physical characteristic, e.g. density, of the 3D object (column 1, lines 25-29; column 17, lines 52-58). Values associated with the physical characteristics of a 3D object other than density can also be used to define the volume data set (column 6, lines 8-13).

It would have been obvious to one skilled in the art, at the time of the applicant's invention, to incorporate the association of at least one physical characteristic, for a given 3D object, with voxels or vertices representative of the volume data of a given 3D object, as taught by Shu et al., into the system taught by Kela, because such an incorporation would allow for additional data representing various physical characteristics of said 3D object to be stored within said octants and as a result would provide further detail as to the characteristics of said 3D object, while utilizing already existing vertices, as taught by Kela, for the storage of said characteristics.

4. In regards to claim 4 the rationale disclosed in the rejection of claim 1 is incorporated herein (Shu et al. – column 1, lines 25-29; column 17, lines 52-58; column 6, lines 8-13). Kela and Shu et al. fail to explicitly teach that each boundary cell has two kinds of physical property values relating respectively to the interior of the object and to regions outside of the object. It would have been obvious to one skilled in the art, at the time of the applicant's invention, to assign each boundary each two physical characteristics, because Shu et al. teaches that more then one physical characteristic can be assigned to a given cell (column 1, lines 25-29; column 17, lines 52-58) and while interior or external cell for a given 3D object would only require one such property

a boundary cell, as taught by Kela, share the properties of both an interior and external cells – thus in fact representing two characteristics within one cell.

5. In regards to claim 7 Kela teaches that the algorithm bas been implemented in C and executed on a sun 3/60 workstation under Unix (p. 7, § Performance of the Algorithm). The rationale disclosed in the rejection of claim 1 is incorporated herein.

6. In regards to claim 10 the rationale disclosed in the rejection of claim 4 is incorporated herein.

7. In regards to claim 13 Kela teaches a first subdivision, in which a given 3D object is subdivided into (first cells) eight octants (page 3, Fig. 3). It is noted said eight octants are considered octants that intersect the boundary of the solid and are in general partially inside the solid (boundary cells). At each stage the solid boundary contained in each NIO octant (boundary cell) is recursively decomposed into the eight successors. NIO octants are then recursively subdivided until a desired level of accuracy is achieved (page 3, § The algorithm). It is noted said recursive subdivision is considered to yield second and third cells (see Fig. 1).

8. In regards to claim 14 the rationale disclosed in the rejection of claim 13 is incorporated herein.

9. In regards to claim 15 the rationale disclosed in the rejection of claim 4 is incorporated herein.

10. Claims 5,11 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kela (Hierarchical octree approximations for boundary representation-based

geometric models) and Shu et al. (U.S. Patent No. 6, 075, 538), as applied to claims 1, 4, 7, 10 and 13-15, in view of Shute (Overview of C Programming).

11. In regards to claim 5 Kela teaches that the algorithm bas been implemented in 'C' (p. 7, § Performance of the Algorithm). Kela and Shu et al. fail to explicitly teach that said physical property values consist of constant values which do not change by simulation, and variables which change as a result of simulation. Shute teaches a variable is a named or unnamed place for storing mutable (able to be changed) data, while a constant is a named or unnamed non-mutable (not able to be changed) program value (page 1, § The C Programming Paradigm).

It would have been obvious to one skilled in the art, at the time of the applicant's invention, to incorporate the teaching of Shute into the system taught by Kela and Shu et al., because conventional programming languages, such as C, utilize both variables and constants as the form of storing data in memory and thus such an incorporation would provide a conventional means by which to store said data as well as a conventional access means to said stored data which would allow for said system to be implement on any variety of computer hardware systems without the need for specialized system.

12. In regards to claim 11 the rationale disclosed in the rejection of claim 5 is incorporated herein.

13. In regards to claim 16 the rationale disclosed in the rejection of claim 5 is incorporated herein.

14. Claims 6, 12, 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kela (Hierarchical octree approximations for boundary representation-based geometric models) and Shu et al. (U.S. Patent No. 6, 075, 538), as applied to claims 1, 4, 7, 10 and 13-15, in combination with Dundorf (U.S. Patent No. 5, 197, 013).

15. In regards to claim 6 Kela and Shu et al. fail to explicitly teach that external data is curved surface data for a 3D CAD or CG tool. Dundorf teaches a method of producing carved signs, wherein the method uses an integration of computer-aided design (CAD), computer-aided machining (CAM) and computerized numerical control (CNC) technology (column 3, lines 41-47). A further object of the present invention is to provide a CAD/CAM system for producing carved signs embodying signage works having 3D incised and/or relieved curved surfaces (column 4, lines 9-12). Dundorf also teaches that octree data structures, operations and algorithms can be used with the CPCS (computer-produced carved sign) design and manufacturing system hereof (column 17, lines 35-37). It is noted that for a CAD/CAM system to produce a given carved sign embodying signage works, having 3D incised and/or relieved curved surfaces, that information pertaining to 3D incised and/or relieved curved surfaces is considered to be required to be entered into said CAD/CAM system prior to the production of said carved signs.

It would have been obvious to one skilled in the art, at the time of the applicant's invention, to combine the teaching of Dundorf with that of Kela and Shu et al., because while Dundorf teaches the use of octree division Dundorf fails to go into the details of

the octree division method utilized for producing carved signs, while Kela and Shu et al. teach a system of hierarchical octree approximations for boundary representation-based geometric models, wherein said system presents a novel technique to derive efficient octree approximations of B-rep solids (page 7, § Summary and Conclusion).

16. In regards to claim 12 the rationale disclosed in the rejection of claim 6 is incorporated herein.

17. In regards to claim 17 the rationale disclosed in the rejection of claim 6 is incorporated herein.

18. In regards to claim 19 it is noted that points on a given edge, of a given boundary octant, which are shared by another given boundary octant and a given 3D object surface are considered corner points (Kela – Fig. 3).

19. Claims 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kela (Hierarchical octree approximations for boundary representation-based geometric models) Shu et al. (U.S. Patent No. 6, 075, 538) and Shute (Overview of C Programming), as applied to claims 5,11 and 16, in view of Dundorf (U.S. Patent No. 5, 197, 013).

20. In regards to claim 20 the rationale disclosed in the rejection of claims 10-11 are incorporated herein. Kela, Shu et al. and Shute fail to explicitly teach that external data is curved surface data for a 3D CAD or CG tool. Dundorf teaches a method of producing carved signs, wherein the method uses an integration of computer-aided design (CAD), computer-aided machining (CAM) and computerized numerical control (CNC) technology (column 3, lines 41-47). A further object of the present invention is to

provide a CAD/CAM system for producing carved signs embodying signage works having 3D incised and/or relieved curved surfaces (column 4, lines 9-12). Dundorf also teaches that octree data structures, operations and algorithms can be used with the CPCS (computer-produced carved sign) design and manufacturing system hereof (column 17, lines 35-37). It is noted that for a CAD/CAM system to produce a given carved sign embodying signage works, having 3D incised and/or relieved curved surfaces, that information pertaining to 3D incised and/or relieved curved surfaces is considered to be required to be entered into said CAD/CAM system prior to the production of said carved signs.

It would have been obvious to one skilled in the art, at the time of the applicant's invention, to combine the teaching of Dundorf with that of Kela, Shu et al. and Shute, because while Dundorf teaches the use of octree division Dundorf fails to go into the details of the octree division method utilized for producing carved signs, while Kela, Shu et al. and Shute teach a system of hierarchical octree approximations for boundary representation-based geometric models, wherein said system presents a novel technique to derive efficient octree approximations of B-rep solids (page 7, § Summary and Conclusion).

21. In regards to claim 21 the rationale disclosed in the rejection of claim 19 is incorporated herein.

Response to Amendment

22. The objection to the specification have been withdrawn in lieu of applicant's remarks.

23. The respective objections to claims 13-14 have been withdrawn in lieu of Applicant's remarks.

24. In response to Applicant's remarks that Kela fails to teach the classification of each divided cell as either a non-boundary cell located in the interior or in the outside region of the object, or as a boundary cell including a boundary surface it is noted that the open ended claim language used (i.e. "...comprising the following steps...") does not limit the classification of cells to only one of a non-boundary cell or a boundary cell.

Kela utilizes three types of octants: octant that are wholly in the interior of the solid (non-boundary cells located in the interior region of the object), octants that are wholly outside the solid (non-boundary cells located in the outside of the region of the object) and octants that intersect the boundary of the solid (boundary cells including a boundary surface of the object) and are in general partially inside the solid (p. 1; Fig. 1).

In response to Applicant's remarks that the references fail to show certain features of Applicant's invention, it is noted that the features upon which Applicant relies (i.e., 2D matrix for dividing and classifying the external data) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In response to Applicant's remarks that the mapping paradigms taught by the Kela and Shu et al. would be inoperative if cell division were limited to only two classifications it is one again noted that said limitation of only two classifications is not recited in the rejected claims.

Thus, Applicant's remarks are deemed unpersuasive.

25. In response to Applicant's remarks that the Examiner admits that the Kela reference does not teach "acquiring cut points" the Office finds no evidence at the locations cited by the Applicant that indicates such an admission.

Furthermore, in response to Applicant's remarks that the Examiner must show where in the prior art, and not the Applicant's disclose, there is a motivation to substitute cut points for boundary cells it is noted that see the rejection of claim 1 above, specially Kela – Figs. 1 and 4.

Thus, Applicant's remarks are deemed unpersuasive..

26. In response to Applicant's remarks that the references fail to show certain features of Applicant's invention, it is noted that the features upon which Applicant relies (i.e., that modified Octree division is superior over conventional Octree division, because less data points are required to map the surface of the same object) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Thus, Applicant's remarks are deemed unpersuasive.

27. In response to Applicant's remarks that Shu et al. fails to teach the limitations disclosed by the Applicant, under Remarks, on page 26, lines 7-19, it is noted that said limitations are in fact rejected under Kela. What Kela fails to explicitly teach is storing the values of physical properties for each of the cells. Shu et al. teaches storing at least

one physical characteristic, e.g. density, of the 3D object for each voxel (column 1, lines 25-29; column 17, lines 52-58).

Thus, Applicant's remarks are deemed unpersuasive.

28. In response to Applicant's remarks that the scope of the teaching of the Shute reference is extremely limited it is noted both the Shute and Kela (p. 7, § Performance of the Algorithm) teach the use of the 'C' language. Furthermore, Shute teaches a variable is a named or unnamed place for storing mutable (able to be changed) data, while a constant is a named or unnamed non-mutable (not able to be changed) program value (page 1, § The C Programming Paradigm). Said teachings are considered to meet the respective claim limitations.

Thus, Applicant's remarks are deemed unpersuasive.

29. In response to Applicant's remarks that Dundorf fails to teach or even suggest modified Octree division, the two-way classification of cells as either non-boundary or boundary and the step of acquiring cut points it is noted that said limitations are in fact rejected under Kela.

Thus, Applicant's remarks are deemed unpersuasive.

30. In response to Applicant's remarks that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., corner points are defined by Figure 4 of the present application, as originally filed, to include points that are not shared by another given boundary octant) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988

F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). It is noted claim 19 and 21 claim "expressing corner points by cut points possessed by adjacent boundary cells."

Thus, Applicant's remarks are deemed unpersuasive.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter-Anthony Pappas whose telephone number is 571-272-7646. The examiner can normally be reached on M-F 9:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman can be reached on 571-272-7653. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PAP

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